

**REMARKS**

Claims 1-11 are pending in this application. By this Amendment, new claims 10-11 are added. No new matter is added. Reconsideration in view of the above amendments and the following remarks is respectfully requested.

The courtesies extended to Applicant's representative by Examiner Kim at the interview held on May 10, are appreciated. The reasons presented at the interview as warranting favorable action are incorporated into the remarks below and constitute Applicants' record of the interview.

The Office Action rejects claims 1-5, 8, and 9 under 35 U.S.C. §103(a) as being unpatentable over Ota et al. (U.S. Patent No. 6,040,886) in view of Lu (U.S. Patent No. 6,426,786 B1); rejects claim 6 under 35 U.S.C. §103(a) over Ota in view of Lu and further in view of Baek et al. (U.S. Patent No. 6,657,689); and rejects claim 7 under 35 U.S.C. §103(a) as being unpatentable over Ota in view of Lu and further in view of Hayashi (U.S. Patent No. 6,540,361). Applicants respectfully traverse the rejections.

**I. Combination of Ota and Lu Destroys System of Ota**

Specifically, Applicants assert asserts that it would not have been obvious to one having ordinary skill in the art at the time the invention was made to modify the nematic liquid crystal mixture having a *negative dielectric anisotropy* of the LCD system of Ota (see col. 7, lines 30-31 of Ota) with the liquid crystal of Lu which exhibits *homeotropic alignment in the initial alignment state* (see col. 7, lines 1-5 of Lu) because the combination of Ota and Lu would result in an invention that is inoperable for its intended purpose.

A liquid crystal molecule exhibiting homeotropic alignment in the initial alignment state has a substantially vertical alignment with respect to the substrate in the absence of an electric field. In addition, when the liquid crystal molecule has negative dielectric anisotropy, the minor axis of the molecule tends to align with the direction of the electric field.

In Fig. 12(b) of Ota, even though the pixel electrode and the shield electrode are opposed to each other, the display of Ota is only enabled by a lateral electric field. Specifically, in Fig. 12(b) of Ota, the electric field E is substantially lateral (parallel to the substrate) in the region where the passing light is represented by the space between the two long vertical arrows (hereinafter "light-passing region").

Thus, in Fig. 12(b) of Ota, when an electric field is applied, the liquid crystal molecules having negative dielectric anisotropy and exhibiting homeotropic alignment in the initial alignment state will show substantially no change in alignment in the light-passing region because the minor axis of the molecules would have already been aligned with the direction of the lateral electric field. Consequently, since no switching movement of the liquid crystal molecules is possible, the light passing through the light-passing region would be unaffected, thus rendering the modified system of Ota inoperable.

Accordingly, Applicants assert that the combination of Ota and Lu would not have been obvious to one having ordinary skill in the art at the time the invention was made because the combination of Ota and Lu would result in an invention that is inoperable for its intended purpose.

## **II. Motivation to Combine Ota and Lu is Improper**

The Office Action asserts that the motivation for modifying Ota and Lu is to provide precise alignment of the liquid crystals (see col. 3, line 13 of Lu). Applicants respectfully traverse this assertion. Specifically, Applicants assert that the motivation "to provide precise alignment of the liquid crystals" for replacing liquid crystals exhibiting homogeneous alignment of Ota with the liquid crystals exhibiting homeotropic alignment of Lu is improper.

In Lu, the high contrast is achieved by preventing alignment non-uniformity that can occur when liquid crystals with homeotropic alignment are used (see col. 3, lines 7-13 of Lu). This alignment non-uniformity is prevented by using the alignment structure described

throughout Lu to maintain the crystals with homeotropic alignment within a desired pretilt angle. Thus, this "high contrast" is a comparison between different liquid crystals with homeotropic alignment in varying locations.

Accordingly, Applicants assert that the motivation "to provide precise alignment of the liquid crystals" for replacing liquid crystals exhibiting homogeneous alignment of Ota with the liquid crystals exhibiting homeotropic alignment of Lu is improper.

### **III. New Claims 10-11**

Support for new claims 10-11 can be found in Fig. 2 of the present specification. As shown in Fig. 2, each pixel electrode 11 overlaps the light shielding film in the region between the square shape of the pixel electrode 11 and the corresponding opening 21' of the light shielding film 21. Because the pixel electrodes and the light shielding layer overlap, the electric field extends somewhat vertically between the pixel electrodes and the light shielding layer. Furthermore, because the light shielding layer surrounds a region of each pixel electrode, the negative dielectric anisotropy liquid crystal molecules become radially aligned during the presence of the electric field, as shown in Fig. 4 of the present specification.

Applicants assert that Ota, Lu, Baek, and Hayashi, individually or in combination, fail to disclose a liquid crystal device, wherein the conductive light shielding film overlaps the pixel electrodes in plan view and surrounds a region of each of the pixel electrodes in plan view, as recited in dependent claims 10-11.

In stark contrast, Ota, in Fig. 12(b), discloses a shield electrode 14b that does not overlap or surround a pixel electrode 3. Thus, Ota fails to disclose a liquid crystal device, wherein the conductive light shielding film overlaps the pixel electrodes in plan view and surrounds a region of each of the pixel electrodes in plan view, as recited in dependent claims 10-11.

Lu, in Fig. 5A, merely discloses a protrusion (or ridge-like) structure having a plurality of protrusions on a first and second substrates. Lu, however, fails to disclose a liquid crystal device, wherein the conductive light shielding film overlaps the pixel electrodes in plan view and surrounds a region of each of the pixel electrodes in plan view, as recited in dependent claims 10-11.

Baek and Hayashi also do not disclose the features of claims 10-11, and therefore, fail to make up for the deficiencies of Ota and Lu.

Accordingly, Applicants assert that Ota, Lu, Baek, and Hayashi, individually or in combination, fail to disclose a liquid crystal device, wherein the conductive light shielding film overlaps the pixel electrodes in plan view and surrounds a region of each of the pixel electrodes in plan view, as recited in dependent claims 10-11.

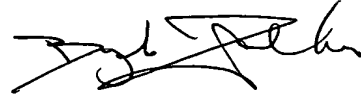
#### **IV. Conclusion**

In accordance with the above remarks, Applicants submit that independent claims 1 and 9, and new dependent claims 10-11 define patentable subject matter. Claims 2-8 depend from claim 1, and therefore, also define patentable subject matter, as well as for the additional features they recite. Thus Applicants respectfully request that the Examiner withdraw the §103(a) rejections.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 1-11 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,



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